Attachment 2

Analysis of Options

To assist the Commission, the staff has evaluated the following options for Commission consideration. The following paragraphs include an evaluation of the options, including consideration of how the options would impact the four performance goals of the Strategic Plan in NUREG-1614.

Option 1 No action; maintain status quo. In this option, NRC would not conduct a rulemaking to revise Part 20 at this time, and would instead defer any effort in this area to wait for more clarity in models and recommendations at some later time, probably after completion of the DS02, BEIR VII, and DOE studies in late 2003. Under this option, NRC would retain the current occupational dose limits in Part 20. With regard to dosimetry methods, NRC would continue the current practice of review of exemption requests that allow licensees to use current ICRP dosimetric models in performing dose and risk assessments. With regard to dose-based rulemakings, NRC would review appropriate use of ICRP dosimetric models on a case-by-case basis.

Advantages:

1) Public and occupational health is already adequately protected by Part 20. The ICRP Publication 60 recommendation for the public dose limit is already codified in Part 20, and lowering the occupational dose limit would not substantially increase worker protection (most workers' annual doses are < 2 rems (<20 mSv)).
2) The risk coefficient for cancer mortality used in the current regulations may require no change if, after completion of DS02 and BEIR VII, the cancer risk coefficients revert back toward those contained in ICRP Publication 26.
3) An regulatory framework already exists under which licensees can request license amendments to use the new dosimetric models and dose coefficients that may yield lower committed effective dose equivalents.
4) Revisions to other dose-based regulations, e.g., the Part 71 revision, could refer to Publications 66 and 68-72, as appropriate.
5) Resources would not need to be diverted from other activities to conduct a rulemaking at this time.

Disadvantages:

1) NRC regulations would continue to not be compatible with other nations that are adopting the 1990 recommendations and subsequent changes in dosimetric modeling.
2) NRC would continue to have to review licensee requests for use of new dosimetric methods in dose assessments on a case-specific basis as exemptions. Although the number of licensing cases proposing to use the ICRP dosimetry has been very limited, there have been frequent informal contacts from both NRC and Agreement State licensees inquiring as to how to go about using the newer ICRP internal and external dosimetry methods in their licensing activities.
3) Not adopting the newer dosimetric models can result in: (1) overestimation of committed effective dose equivalent to some nuclear fuel cycle workers, (2) overestimation of

exposure to children and infants to some nuclear reactor effluents (e.g., Sr-90 and Cs-137), (3) underestimation of thyroid exposure to radio iodine, and (4) potential enforcement issues in cases where licensees exceed, or potentially exceed, dose limits even though it is known that in some cases the Part 20 methods for assessing internal and external dose are overly conservative.

4) Using ICRP Publications 66 and 68-72 for new regulations may result in values in Appendix B, Part 20 being derived from both new and old systems. For example, if Appendix B were to be revised to include the unrestricted release of slightly contaminated solid materials based on newer models and dose coefficients, there would be inconsistency with other values in Appendix B, which are based on older models and dose coefficients.
5) Taking no action would ignore the issues related to a potential need to revise Part 20 and would also not lead toward developing a formalized plan under which NRC could seek to gain further insights on potential approaches to revising Part 20 and impacts associated with those approaches.

NRC's performance goals. Option 1 would continue to achieve the goal of maintaining public health and safety because public and worker protection would be unaffected. This option would tend to decrease public confidence because there may be some confusion and concern because NRC's approach differs from other countries, because there are some over/under estimations in particular cases, and because there can be potential enforcement issues. This option would not make NRC's activities and decisions more effective and efficient nor reduce unnecessary regulatory burden because it would continue to require case-specific determinations, result in some over/underestimations, and not be compatible with other nations.

Cost of Option 1. No NRC, Agreement State, or licensee cost related to a rulemaking or other back-fit is associated with this option.

Option 2 Conduct a rulemaking to revise Part 20 at this time. This option could take one of the approaches described below:

Option 2a Revise Part 20 to delete sections that are used to assess radiation exposure and place them in Regulatory Guidance documents. However, do not formally adopt revised dosimetric models and related parameters into Part 20 and make no change in Part 20 regarding the occupational dose limits.

Examples of sections that may be revised or moved to guidance documents are:

1. Remove §20.1003, Table of organ dose weighting factors.
2. Remove Table 1004(B).1-Quality Factors and Absorbed Dose Equivalencies
3. Remove Table 1004(B).2-Mean Quality Factors, Q, and Fluence per Unit Dose Equivalent for Monoenergetic Neutrons.
4. Remove Appendix B.
5. Revise §20.1003 definitions to be consistent with Publication 60.

Advantages:

1) There would continue to be protection of public and occupational health for the reasons noted in advantage #1 for Option 1

2) It would be easier to adopt future recommendations on new dosimetric models and related parameters by revising guidance instead of Part 20.
3) Having the dose assessment provisions in guidance rather than regulations would allow greater flexibility in using appropriate methodology.

Disadvantages:

1) There would still be incompatibility with international recommendations and a need for case-specific review of dosimetry as described in disadvantages #1 and #2 of Option 1.
2) Resources to carry out a rulemaking could be substantial and the related costs for NRC and the Agreement State costs may not be justifiable considering that there would not be an increase in public health and safety and that the increase in efficiency and reduction in burden would likely be minimal.

NRC's performance goals. Option 2a would continue to achieve the goal of maintaining public health and safety because public and worker protection would be unaffected. This option may not achieve a goal of increased public confidence because there may still be some confusion as to why NRC's occupational exposure criteria differ from other countries and also concern as to why rule requirements are being eliminated. This option would tend to make NRC's activities and decisions more effective and efficient, and reduce unnecessary regulatory burden, compared to Option 1 because it would allow for more flexibility under the regulations in handling case-specific dose assessments. However, Option 2a could involve an extensive rulemaking process to revise Part 20 which may not be commensurate with the benefit realized and whose results might need to be modified pending completion of major national/international studies.

Option 2b: Revise Part 20 to formally adopt the newer dosimetric models and related parameters, but do not change the occupational dose limits in Part 20.

Advantages:

1) Part 20 would be revised to provide consistency with new ICRP methodologies.
2) Licensees could use the new dosimetric models without obtaining case-by-case approval from NRC.
3) Permitting the use of the models and related parameters in Publications 66, and 68-72 would: (1) reduce the internal dose to some nuclear fuel cycle workers (e.g., exposure to U, Th, and Pu), (2) reduce the internal dose to children and infants exposed to some nuclear reactor effluents (e.g., Sr-90 and Cs-137), and (3) increase the internal dose to children exposed to radio iodine, radium, and technicum.
4) There would be consistency between Part 20 and with other recent dose-based regulations being developed, e.g., the Part 71 revision.
5) Permitting the newer dosimetric methods in Part 20 will enable the U.S. and other countries to harmonize the development of technical bases for dose-based radiation standards.

Disadvantages:

1) Substantial resources for a complete revision of Part 20, Appendix B would be required to incorporate new models and dose coefficients. Whether these resources are justified is

not clear as a majority of the dose coefficients in Publication Nos. 68-72 are similar to those in Publication 30 (when differences are apparent, slightly more dose coefficients have increased relative to ICRP Publication 30 compared to those that have decreased). In addition, a majority of occupational workers exposed to ionizing radiation are exposed externally, not internally, and thus, permitting new methodologies for calculating internal dose may not have any impact on these workers. Finally, ICRP is considering changing the dose coefficients by 1.5 to 2 fold in its next set of recommendations.

2) NRC would need to revise Part 20 again if ICRP made additional recommendations based on new information or new data. Revising policy and procedures to reflect every new ICRP position would impose a significant burden without commensurate benefit.

NRC's performance goals Option 2b would continue to achieve the goal of maintaining public health and safety because public and worker protection would be unaffected. However lowering the occupational dose limit from 5 rem/yr to 2 rem/yr would have very little health and safety impact because the current exposure levels of nearly all workers in the U.S., with very few exceptions, are already considerably below 2 rem/yr as a result of application of ALARA within the existing regulatory framework. This option may provide some increase in public confidence due to consistency in dose modeling between NRC and other nations, however there could also be a decrease in public confidence because the amount of radioactivity allowed to be released and still meet dose limits would increase for some radionuclides under the new modeling. Also, there could be concern as to why NRC occupational dose limits would differ from the 1987 Presidential Guidance and other U.S. federal agencies, who are required to follow the Presidential Guidance, or if dose models were to be changed again after completion of DS02 and BEIR VII. This option would contribute to the goals of making NRC's activities and decisions more effective and efficient, and reducing unnecessary regulatory burden, more than Option 1 because it would allow for greater consistency in dose assessments and rulemakings on dose-based regulations, both internally and with other nations. However, Option 2b could involve an extensive rulemaking process to revise Part 20 which may not be commensurate with the benefit realized and whose results might need to be modified pending completion of major national/international studies.

Option 2c: Revise Part 20 to adopt both the dosimetric models and related parameters and the occupational dose limits, as recommended by ICRP.

Advantages

1) Advantages with regard to consistency with ICRP methodologies, removing need for case-specific reviews, and consistency of bases amongst NRC dose-based regulations, would be similar to those of advantages #1 - 5 of Option 2b.
2) The occupational dose limit in §20.1201 would conform to the 1990 recommendations of the ICRP.

Disadvantages

1) Disadvantages with regard to expenditure of resources to incorporate ICRP methodologies into Part 20, whether this expenditure would be cost-effective, and whether Part 20 would have to be revised again when further revisions to the ICRP methodologies are made, would be similar to Disadvantages #1 and 2 of Option 2b.

2) Reducing the occupational dose limit would suggest that the current occupational dose limit is not adequately protective.
3) Changing the Part 20 limits for occupational dose may not be cost effective. Further, exposure to workers who are currently receiving doses in excess of 2 rems (20 mSv) may not be easily reduced without extensive modifications of equipment or procedures, such as steam generation, maintenance, and refueling in nuclear power plants.
4) There may be issues with regard to the backfit regulations of Part 50.109 as to whether the increased regulatory requirements for nuclear power reactors are justified by commensurate substantial increase in worker safety.
5) The staff may need to evaluate whether there would be an impact on the reactor safety goals because the current safety goals are based on the mortality risks whereas the new recommendations consider total detriment.

NRC performance goals Option 2c would continue to achieve the goal of maintaining public health and safety. Although Option 2c would result in lower occupational dose limits, the net effect of the lower limits would be small, as noted for Option 2b, because most licensees are already in compliance with these lower levels and because this change may not be cost effective. Thus, Option 2c is not considered to provide significant added public and worker protection compared to the other options. This option may provide some increase in public confidence due to consistency in dose modeling and a lowering of occupational dose limits, however there could also be a decrease in public confidence because the amount of radioactivity allowed to be released and still meet dose limits would increase for some radionuclides under the new modeling. Also, there could be some concern as to the adequacy of current occupational exposure standards if NRC is considering new standards and consistency with the 1987 Presidential Guidance used by other federal agencies. This option could tend to make NRC's activities and decisions more effective and efficient, while decreasing unnecessary regulatory burden, compared to other options because it would allow for more consistency in dose assessments and related rulemakings with other nations. However, Option 2c could involve an extensive rulemaking process to revise Part 20 which may not be cost-effective and whose results might need to be modified pending completion of major national/international studies.

Costs for Option 2. The costs for Options 2a, 2b, and 2c would be similar and involve approximately 12 FTE over 3 years to develop a final rule. Contract support for rulemaking development, development of technical bases for implementation, and support for an estimated 4 public meetings and/or workshops, is estimated to be about $1,000,000. There would be some variation amongst the suboptions for specific actions such as guidance development, revisions to Appendix B of Part 20, etc. These costs would the similar to those discussed under Option 3 below, but NRC may have to bear a much greater share of the costs, compared to the costs under Option 3, because of the need to accelerate the development of such a technical base to keep pace with rulemaking activities.

Option 3: Do not conduct rulemaking at this time, but initiate a pro-active effort to elicit a better understanding of significant issues and concerns. This option would not involve the extensive resource effort involved in a rulemaking under Option 2, but it would begin a process to put NRC in a better position to react to completion of the DS02, BEIR VII, and DOE studies in 2003 than the status quo approach of Option 1. Option 3 would first involve preparation of a communication plan (based on use of information exchange processes already in place) to gather views from stakeholders and scientific

organizations on basic issues such as the need for and implications of a change, resources involved in current and potential requirements, etc. Option 3 would also involve developing a technical information base to provide a better understanding of impacts of alternative changes to Part 20. As part of this effort, NRC could begin developing software and staff expertise necessary to implement current ICRP recommendations and models, as well as future guidance that ICRP may publish. Subsequently, Option 3 would involve NRC monitoring work on the revision to ICRP Publication 60. This phase of Option 3 would be further clarified as the above activities proceed.

Advantages

1) Advantages with regard to maintenance of public and occupational health and safety, existence of a regulatory framework for case-specific reviews of licensee amendments, and development of dose-based regulations are similar to advantages #1-4 of Option 1.
2) This option would begin a process to put NRC in a position to react to completion of the DS02 and BEIR VII by gathering further information from stakeholders and other scientific organizations on such issues as need for and implications of a change, resources involved in current and potential requirements, etc.
3) This option would begin a process of consideration of revision of Part 20 while not committing substantial resources at this time to a rulemaking that may not be cost-effective and that may need revision soon after its completion to incorporate various national/international studies.

Disadvantages

1) Disadvantages with regard to inconsistency of standards and models with other nations and between 10 CFR Parts and need for case-specific reviews would be similar to disadvantages #1-4 of Option 1. However tempering these disadvantages is that a process for considering revision would have begun and also that the current burden for case-specific reviews is not great.
2) Consideration would have to be given to reactor safety goals as noted in disadvantage #5 of Option 2c.

NRC performance goals Option 3 would continue to achieve the goal of maintaining public health and safety because public and worker protection would be unaffected. While there may be some confusion as to why NRC's approach differs from other countries under this option, the long-term communications program for considering a re-assessment of Part 20 may tend to increase public confidence. This option would not, in the short-term, make NRC's activities and decisions more effective and efficient nor reduce unnecessary regulatory burden because it would continue to require case-specific determinations and not be compatible with other nations; however this impact is tempered by the fact that the burdens associated with this are not considered significant and because this option would avoid the commitment of substantial resources to an extensive rulemaking process to revise Part 20 which may not be cost-effective and whose results might need to be modified pending completion of major national/international studies.

Costs for Option 3. There would not be costs for this option for conducting rulemaking to revise Part 20 or for potential back-fits. Costs related to development and implementation of a communication plan would be minor and would be borne within existing budgets. Resources

would be required to develop a technical information base for Option 3 that is needed to provide a better understanding of the impact of alternative changes to Part 20. Several federal agencies, such as DOE and EPA, are developing some of this technical information base, and other organizations, such as governmental and private organizations in other countries, are engaged in similar activities. It may therefore only be necessary that NRC adapt these tools to its own needs, train its staff in their use, and develop guidance documents. Based on this approach, it is estimated that the NRC resources would be about 2 FTE and $300 K. Development of a communications plan, designed to gather views from stakeholders on the basic issues, could be achieved through meetings and interchanges that are scheduled to take place as part of currently budgeted activities. Additional resources for the technical development phase of Option 3 would be addressed through the PBPM process. Eventual costs for initiating extensive potential rulemaking related actions after completion of DS02 and BEIR VII and during completion of ICRP 60 revisions would be estimated and included in the planning for later budgets.